WE CLAIM

CLAIMS

1. A method of detecting a defect in a fiber preform residing in a molding cavity, comprising flowing a gas through the mold cavity containing the fiber preform, measuring gas pressures at multiple locations on a mold wall during gas flow through the mold cavity containing the fiber preform, and analyzing the gas pressures, or results derived therefrom, using discriminant analysis to detect a defect in the fiber preform.

2. A method of detecting a defect in a fiber preform residing in a molding cavity, comprising flowing a gas through the mold cavity containing the fiber preform, measuring gas pressures at multiple locations on a mold wall during gas flow through the mold cavity containing the fiber preform, calculating gas pressures at the same mold wall locations, normalizing the measured pressures with respect to the calculated pressures to provide normalized pressure data, and analyzing the normalized pressure data, or results derived from the measured and calculated gas pressures, using discriminant analysis to detect a defect in the fiber preform.

3. The method of claim 2 wherein the calculating of the pressures at the mold location is conducted by control volume finite element analysis.

4. The method of claim 2 wherein the discriminant analysis is conducted by multivariate analysis of variance.

5. The method of claim 2 wherein the discriminant analysis is conducted using the following canonical discriminant function:

$$DF^j = \sum_{i=1}^{N} c_i^j \Delta P_i \qquad (5)$$

where c_i^j is the i-th coefficient for the j-th discriminant function.

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6. A method of detecting and characterizing a defect in a fiber preform residing in a molding cavity, comprising flowing a gas through the mold cavity containing the fiber preform, measuring gas pressures at multiple locations on a mold wall during gas flow through the mold cavity containing the fiber preform, and analyzing the measured pressures, or results derived therefrom, to determine membership of the fiber perform in one of two or more groups that include a standard defect-free group and a defective group, whereby the method determines if the fiber preform deviates from the standard defect-free group.

7. The method of claim 6 wherein the defective group is associated with a specific type of defect.

8. The method of claim 6 wherein the analyzing of the measured pressures, or the results derived therefrom, is conducted by discriminant analysis using a data base generated from previous tests of fiber performs wherein the fiber performs have been grouped by existence, location, severity, and type of defect thereof.

9. The method of claim 6 wherein said results comprise local permeability variation results determined from the measured pressures.

10. The method of claim 6 wherein the following canonical discriminant function is employed which enters all independent variables together,

$$DF_{km} = u_0 + \sum_{i=1}^{N} u_i P_{ikm} \qquad (6)$$

where the u's are the canonical coefficients obtained from the solution of a system of simultaneous equations relating the between-groups sums of squares and cross products matrix to the within-groups sums of squares and cross products by an eigenvalue and variable coefficients, and wherein the subscripts k and m refer to the groups and test preforms, respectively.

11. The method of claim 6 including determining location and severity of any defect detected.